## Remarks

Applicant has reviewed the Office Action dated as mailed July 24, 2006, and the documents cited therewith. After the above-amendments have been made, the present application contains claims 1, 2, 4-19, 21-26, 33-40, and 42-48. Claims 1, 2, 4, 5, 8, 10, 12-14, 19, 21, 22, 33, 34, 36, 39, and 40 have been amended. Claims 3, 20, 27-32, and 41 have been canceled. New claims 47 and 48 have been added.

The specification has been amended as requested by the examiner.

### *Claim Rejections under 35 U.S.C. §101*

Claim 1-2, 5, 8-13, 14-26, 33-35, 37-38, 39-41 and 45-46 were rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. Applicant respectfully submits that the claims recite a useful, concrete, tangible result. Reconsideration and withdrawal of the Section 101 rejection of these claims is respectfully requested.

### *Claim Rejections under 35 U.S.C. §112*

Claims 1, 3 and 39 were rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Claims 1, 14, 33 and 39 were also rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Further, claims 1, 33 and 39 were rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential steps. These rejections are respectfully traversed. Applicant respectfully submits that claims 1, 14, 33 and 39 have been amended to satisfy the requirements of 35 U.S.C. §112. Reconsideration and withdrawal of the Section 112 rejection of these claims is respectfully requested.

## *Claim Rejections under 35 U.S.C. §102*

Claims 1, 14, 33 and 39 were rejected under 35 U.S.C. §102(e) as being anticipated by Jain et al. (U.S. Patent 6,904,578; hereinafter "Jain"). This rejection is respectfully traversed. Claim 1 has been amended to recite:

> "forming a first bit vector equation in response to unwinding a representation of the circuit design written in a first computer language;
> forming a second bit vector equation in response to unwinding another representation of the circuit design written in a second computer language;
> comparing the bit vector equations; and
> outputting an indication whether the bit vector equations are consistent."

Applicant respectfully submits that there is no teaching or suggestion in Jain of the features of the embodiment of the present invention recited in claim 1. Accordingly, Applicant respectfully submits that claim 1 is patentably distinguishable over Jain, and reconsideration and withdrawal of the 35 U.S.C. §102 rejection of claim 1 is respectfully requested.

Turning now to the rejection of independent claims 14, 33 and 39 35 U.S.C. §102(e) as being anticipated by Jain, these claims have been amended to recite similar features to independent claim 1. Therefore, these claims are also submitted to be patentably distinguishable over Jain for the same reasons as discussed with respect to claim 1. Reconsideration and withdrawal of the Section 102 rejection of claims 14, 33 and 39 is respectfully solicited.

Claims 1-26 and 33-46 were rejected under 35 U.S.C. §102(e) as being anticipated by Shtrichman (U.S. Patent 7,047,139; hereinafter "Shtrichman"). This rejection is respectfully traversed. Claim 1 has been amended to recite the features as quoted above. In contrast, Shtrichman teaches in column 5 beginning at line 64 and continuing in column 6:

> "There is therefore provide, in accordance with a preferred embodiment of the present invention, a method for satisfiability (SAT) testing, given a set of formulas describing a target system, the formulas including clauses that include variables and express constraints on states of the system, the set of formulas including at least a first and a second formula ..."

Applicant respectfully submits that there is no teaching or suggestion in Shtrichman that the set of formulas describing the target system are written in different computer languages. Additionally, Shtrichman does not teach or suggest forming a first bit vector equation in response to unwinding a representation of the circuit design written in a first computer language and forming a second bit vector equation in response to unwinding another representation of the circuit design in a second computer language. Further, Shtrickman does not teach or suggest comparing the bit vector equations and outputting an indication whether the bit vector equations are consistent as provided by the embodiment of the present invention recited in amended claim 1 as reproduced above. For all of these reasons, Applicant respectfully submits that claim 1 is patentably distinguishable over Shtrichman and reconsideration and withdrawal of the 35 U.S.C. §102(e) rejection of claim 1 is respectfully solicited.

With respect to the rejection of claims 2-13 under 35 U.S.C. §102(e) as being anticipated by Shtrichman, these claims recite additional features which further patentably distinguish over Shtrichman. For example, claim 2 recites:

> "conjoining the first and second bit vector equations to form a conjoined equation; and
> passing the conjoined equation to a decision procedure to determine whether the conjoined equation is satisfiable by an assignment of variables within the conjoined equation that makes the equation true."

Applicant respectfully submits that there is no teaching or suggestion in Shtrichman of conjoining the first and second bit vector equations to form a conjoined equation and passing the conjoined equation to a decision procedure as provided by the embodiment of the present invention as recited in claim 2.

Claim 4 recites "translating each bit vector equation into a SAT instances". Application respectfully submits that there is no teaching or suggestion in Shtrichman of translating each bit vector equation into a SAT instances as provided by the embodiment of the present invention as recited in claim 4.

Claim 5 recites:

"forming a Boolean equation from the bit vector equations;
converting the Boolean equation to a conjunctive normal form; and
running a SAT procedure using the conjunctive normal form as an input."

Applicant respectfully submits there is no teaching or suggestion of forming a Boolean equation from the bit vector equations; converting the Boolean equation to a conjunctive normal form; and running a SAT procedure using the conjunctive normal form.

Claims 6-13 recite further features which are not taught or suggested by Shtrichman. Additionally, claims 2-13 depend either directly or indirectly from independent claim 1 and by virtue of that dependency contain all of the features of claim 1. Therefore, Applicant respectfully submits that claims 2-13 are also patentably distinguishable over Shtrichman, and reconsideration and withdrawal of the Section 102 rejection of these claims is respectfully requested.

Regarding the rejection of independent claim 14 under 35 U.S.C. §102(e) as being anticipated by Shtrichman, claim 14 has been amended to recite similar features to claim 1. Therefore, claim 14 is also submitted to be patentably distinguishable over Shtrichman for the same reasons as discussed with respect to claim 1. Reconsideration and withdrawal of the 35 U.S.C. §102 rejection of claim 14 is respectfully solicited.

With regard to the rejection of claims 15-19 and 21-26, these claims recite additional features similar to claims 2-13 and which further patentably distinguish over Shtrichman. Additionally, these claims depend either directly or indirectly from independent claim 14. Because of this dependency, claims 15-19 and 21-26 contain all of the features of independent claim 14. Accordingly, Applicant respectfully submits that claims 15-19 and 21-26 are also patentable over Shtrichman, and reconsideration and withdrawal of the 35 U.S.C. §102 rejection of these claims is respectfully solicited.

With respect to the rejection of claims 33-46 under 35 U.S.C. §102(e) as being anticipated by Shtrichman, independent claims 33 and 39 have been amended to recite similar features to claim 1. Therefore, Applicant respectfully submits that claims 33 and 39 are patentably distinguishable over Shtrichman for the same reasons as discussed with respect to

claim 1. Reconsideration and withdrawal of the 35 U.S.C. §102 rejection of independent claims 33 and 39 is therefore respectfully requested.

Claims 34-38 depend either directly or indirectly from independent claim 33, and claims 40-46 depend either directly or indirectly from independent claim 39. Because of these dependences, claims 34-38 contain all of the features of independent claim 33 and claims 40-46 contain all of the features of independent claim 39. Accordingly, Applicant respectfully submits that these claims are also patentably distinguishable over Shtrichman, and reconsideration and withdrawal of the Section 102 rejection of these claim is respectfully solicited.

New claim 47 recites "outputting an indication that the circuit design written in the first computer language is consistent with the circuit design written in the second computer language in response to the conjoined equation not being satisfied." Applicant respectfully submits that there is no teaching or suggestion in Jain or Shtrichman of this feature. Additionally, claim 47 depends directly from dependent claim 2 which depends from claim 1. By virtue of these dependencies, claim 47 contains all of the features of claims 1 and 2. Accordingly, new claim 47 is submitted to be patentable over the documents of record and allowance of claim 47 is respectfully requested.

New claim 48 recites "using the circuit design written in the second computer language to simulate and test the circuit in response to the conjoined equation not being satisfiable, wherein the first computer language is a hardware description language and the second computer language is a programming language". Applicant respectfully submits that there is no teaching or suggestion of this feature of the embodiment of the present invention recited in claim 48 in Jain or Shtrichman. Additionally, claim 48 depends directly from claim 47, which depends from claims 1 and 2 as previously discussed. Therefore, claim 48 contains all of the features of claim 1, 2 and 47. Thus, claim 48 is also submitted to be patentable over Jain and Shtrichman, and allowance of claim 48 is respectfully solicited.

Claims 1-26 and 33-46 were rejected under 35 U.S.C. §102(a) as being anticipated by Clarke et al., "Hardware Verification Using ANSI-C Programs as a Reference," DAC, Jan. '03, pp. 308-311 (hereinafter "Clarke"). This rejection is respectfully traversed.

Initially, it should be noted that 35 U.S.C. §116 permits multiple inventive entities in one application and that inventors may apply for a patent jointly, even though each did not make a contribution to the subject matter of every claim of the patent. Further, Rule 1.45 provides for different inventive entities to join in an application by stating that:

> "(c) If multiple inventors are named in a nonprovisional application, each named inventor must have made a contribution, individually or jointly, to the subject matter of at least one claim of the application and the application will be considered to be a joint application under 35 U.S.C. 116."

Applicants have included with this Amendment and Response a Declaration under 35 U.S.C. §132 (Appendix A) executed by inventors Edmund M. Clarke and Daniel Kroening attesting to the fact that Dr. Clark and Dr. Kroening are authors of Clarke and also co-inventors along with Karen Yorav of the subject matter of at least one claim of the present application. Further, Clarke and Kroening further declare that notwithstanding the authorship of Clarke, Karen Yorav is a co-inventor of the subject matter of at least one of the claims of the present application. Thus, Karen Yorav is properly included as a joint applicant of the application under 35 U.S.C. §116. Accordingly, the rejection of claims 1-26 and 33-46 under 35 U.S.C. §102(a) as being anticipated by Clarke is improper because the authors are also inventors of the subject matter of the claims and notwithstanding the authorship of Clarke, the third co-inventor contributed to the subject of at least one of the claims of the present application. The enclosed affidavit is respectfully submitted to be sufficient to remove the cited publication as a competent reference under 35 U.S.C. §102(a).
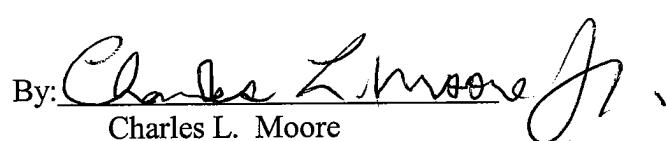
## *Conclusion*

If the Examiner has any questions about the present Amendment or anticipates finally rejecting any claim of the present application, a telephone interview is requested.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 13-4365.

Respectfully submitted,

Edmund M. Clarke
(Applicant)

Date: December 21, 2006

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# APPENDIX A

| Appl. No. | : | 10/708,056 | Confirmation No.: 2055 |
| Applicant: | : | Edmund M. Clarke, et al. | |
| Filed: | : | February 5, 2004 | |
| Title: | : | Method and System to Verify a Circuit Design | |
| TC/A.U. | : | 2825 | |
| Examiner: | : | Vuthe Siek | |

| Docket No. | : | 361007-000031 |
| Customer No. | : | 24,239 |

Mail Stop: Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

**DECLARATION UNDER 37 C.F.R. § 1.132 THAT INVENTORS NAMED IN THIS APPLICATION CONCEIVED OR INVENTED THE SUBJECT MATTER OF THIS APPLICATION AND WHICH IS DISCLOSED IN THE CITED PUBLICATION**

I, Edmund M. Clarke and Daniel Kroening, hereby declare:

1. THAT I am a named co-inventor of the invention that is described and claimed in U.S. Patent Application 10/708,056 filed in the United States Patent and Trademark Office on February 5, 2004 in the names of Edmund M. Clarke, Daniel Kroening, and Karen Yorav for "METHOD AND SYSTEM TO VERIFY A CIRCUIT" (the "Application").

2. THAT I am familiar with the Office Action from the U.S. Patent and Trademark Office dated as mailed July 24, 2006 in which claims 1-26 and 33-46 were rejected under 35 U.S.C. § 102(a) as being anticipated by Clarke et al., "Hardware Verification Using ANSI-C Programs as a Reference", DAC, January 2003, pp. 308-311 ("Clarke et al.").

3. THAT I am a co-inventor of the subject matter of at least one of claims 1-26 and 33-46 and also a co-author of Clarke et al.

4.  THAT notwithstanding the authorship of Clarke et al., Karen Yorav is a co-inventor of the subject matter of at least one of claims 1-26 and 33-46 of the Application. Thus, Karen Yorav is properly included as a joint applicant of the Application under 35 U.S.C. § 116, which states:

> "When an invention is made by two or more persons jointly, they shall apply for patent jointly and each make the required oath, except as otherwise provided in this title. Inventors may apply for a patent jointly even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent."

5.  I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.


Date:  _12/19/06_ _____        _Edmund M. Clarke_ _____
                                              Edmund M. Clarke


Date: _____        _____
                                              Daniel Kroening

4. THAT notwithstanding the authorship of Clarke et al., Karen Yorav is a co-inventor of the subject matter of at least one of claims 1-26 and 33-46 of the Application. Thus, Karen Yorav is properly included as a joint applicant of the Application under 35 U.S.C. § 116, which states:

> "When an invention is made by two or more persons jointly, they shall apply for patent jointly and each make the required oath, except as otherwise provided in this title. Inventors may apply for a patent jointly even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent."

5. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: _____          _____
                                        Edmund M. Clarke

Date: _12/15/06_____          _____
                                        Daniel Kroening